

## PATENT ABSTRACTS OF JAPAN

(11)Publication number : 10-182865

(43)Date of publication of application : 07.07.1998

(51)Int.Cl.

C08J 9/04

E04B 1/82

(21)Application number : 08-346176

(71)Applicant : SEKISUI CHEM CO LTD

(22)Date of filing : 25.12.1996

(72)Inventor : NAKAMURA HIROZO

YASO MIKI

SONOBE SHUICHI

(54) SOUNDPROOFING SHEET FOR FLOOR

(57)Abstract:

PROBLEM TO BE SOLVED: To obtain a soundproofing sheet for floors which is excellent in soundproofing effect and feeling during walking by forming the sheet from a closed cell foam which has a specified closed cell content and in which through holes are formed from the concave parts of its one side to parts other than convex parts of the other side.

SOLUTION: The underside of a closed cell foam sheet (e.g. one comprising polyethylene or polystyrene) having a closed cell content of at least 35%, pref. a laminate formed by sticking an open cell foam sheet thereto, is formed into a lattice pattern wherein parts other than lattice parts are concaved, and on the other side of the sheet are formed convex parts. Through holes and the convex parts are designed so as to satisfy the relation:  $f_0 = (c/2\pi) \times (s/vl)^{1/2}$  [wherein  $\pi$  is the ratio of the circumference of a circle to its diameter;  $l$  is the length (m) of the through hole;  $s$  is its sectional area (m<sup>2</sup>);  $v$  is the vol. (m<sup>3</sup>) of the concave part wherein the through hole is formed;  $c$  is the sound speed (m/sec); and  $f_0$  is the frequency (Hz)], and the through hole is formed from the center of the concave part of the underside to a part other than the convex part of the upper side. Thus is obtd. a soundproofing sheet which damps sound in the frequency ( $f_0$ ) range of 50-1,000.

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

Copyright (C): 1998,2000 Japan Patent Office



## DERWENT TERMS AND CONDITIONS

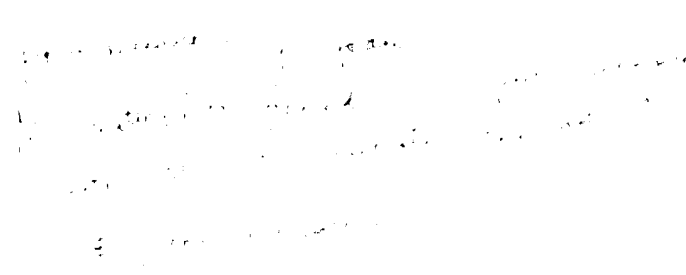
*Derwent shall not in any circumstances be liable or responsible for the completeness or accuracy of any Derwent translation and will not be liable for any direct, indirect, consequential or economic loss or loss of profit resulting directly or indirectly from the use of any translation by any customer.*

Derwent Information Ltd. is part of The Thomson Corporation

Please visit our home page:

["WWW.DERWENT.CO.UK"](http://WWW.DERWENT.CO.UK) (English)

["WWW.DERWENT.CO.JP"](http://WWW.DERWENT.CO.JP) (Japanese)



## MACHINE-ASSISTED TRANSLATION (MAT):

(19) 【発行国】  
日本国特許庁 (JP)

(19)[ISSUING COUNTRY]  
Japanese Patent Office (JP)

(12) 【公報種別】  
公開特許公報 (A)

Laid-open (Kokai) patent application number  
(A)

(11) 【公開番号】  
特開平 10 - 182865

(11)[UNEXAMINED PATENT NUMBER]  
Unexamined Japanese Patent 10-182865

(43) 【公開日】  
平成 10 年 (1998) 7 月 7  
日

(43)[DATE OF FIRST PUBLICATION]  
Heisei 10 (1998) July 7 days

(54) 【発明の名称】  
床用防音シート

(54)[TITLE]  
The sound insulation sheet for floors

(51) 【国際特許分類第 6 版】  
C08J 9/04  
E04B 1/82

(51)[IPC]  
C08J 9/04E04B 1/82

【FI】  
C08J 9/04  
E04B 1/82 C

[FI]  
C08J 9/04  
E04B 1/82 C

【審査請求】  
未請求

[EXAMINATION REQUEST]  
UNREQUESTED

【請求項の数】 5

[NUMBER OF CLAIMS] Five

【出願形態】 OL

[Application form] OL

【全頁数】 5

[NUMBER OF PAGES] Five

(21) 【出願番号】  
特願平 8 - 346176

(21)[APPLICATION NUMBER]  
Japanese Patent Application No. 8-346176

(22) 【出願日】  
平成 8 年 (1996) 12 月 2  
5 日

(22)[DATE OF FILING]  
December 25th, Heisei 8 (1996)

(71) 【出願人】

(71)[PATENTEE/ASSIGNEE]

【識別番号】

[ID CODE]

0 0 0 0 0 2 1 7 4

000002174

【氏名又は名称】

Sekisui Chemical Co., Ltd.

積水化学工業株式会社

【住所又は居所】

[ADDRESS]

大阪府大阪市北区西天満 2 丁目  
4 番 4 号

(72) 【発明者】

(72)[INVENTOR]

【氏名】 中村 浩造

Hirozo Nakamura

【住所又は居所】

[ADDRESS]

埼玉県蓮田市黒浜 3 5 3 5 積  
水化学工業株式会社内

(72) 【発明者】

(72)[INVENTOR]

【氏名】 八十 三喜

Miki Yaso

【住所又は居所】

[ADDRESS]

埼玉県蓮田市黒浜 3 5 3 5 積  
水化学工業株式会社内

(72) 【発明者】

(72)[INVENTOR]

【氏名】 園部 修一

Shuichi Sonobe

【住所又は居所】

[ADDRESS]

埼玉県蓮田市黒浜 3 5 3 5 積  
水化学工業株式会社内

(57) 【要約】

(57)[SUMMARY]

**【課題】**

防音性及び歩行感に優れた床用防音シートを提供する

**【解決手段】**

一方の面に凹部を有し、凹部から他方の面へ貫通孔が形成されている独立気泡率35%以上の独立気泡発泡体からなることを特徴とする床用防音シート

**【特許請求の範囲】****【請求項1】**

一方の面に凹部を有し、凹部から他方の面へ貫通孔が形成されている独立気泡率35%以上の独立気泡発泡体からなることを特徴とする床用防音シート

**【請求項2】**

凹部を有する面の反対面に凸部を有し、貫通孔が凹部から反対面の凸部以外の部分へ形成されていることを特徴とする、請求項1記載の床用防音シート。

**【請求項3】**

凹部が、格子部分以外が凹となるような格子模様形成されていることを特徴とする、請求項1又は2記載の床用防音シート。

**【請求項4】**

凹部を有する面の反対面に、独立気泡率35%未満の連続気泡発泡体が積層されていることを特徴とする、請求項1～3のい

**【SUBJECT】**

The sound insulation sheet for floors excellent in soundproofing and the feeling of a walk is provided.

**【SOLUTION】**

It has concave part in one surface. It comprises the closed cell foam of 35 % or more of the rate of closed cell and which the through holes are formed to the other surface from the concave part.

A sound insulation sheet for floors characterized by the above-mentioned.

**【CLAIMS】****【CLAIM 1】**

A sound insulation sheet for floors, which has concave part in one surface. It comprises the closed cell foam of 35 % or more of the rate of closed cell and which the through holes are formed to the other surface from the concave part.

**【CLAIM 2】**

A sound insulation sheet for floors of Claim 1, which has convex part on the other surface from the surface which has concave part. The through-hole is formed from the concave part to the parts that are not the convex part on the other surface.

**【CLAIM 3】**

A sound insulation sheet for floors of Claims 1 and 2, in which the concave part is formed in the lattice pattern wherein parts other than the lattice part become concave.

**【CLAIM 4】**

A sound insulation sheet for floors of Claim 1-3 described in any 1 clause, in which the open cell foam with a rate of a closed cell of 35 % less is laminated on the other surface from the surface which has concave part.

いずれか1項記載の床用防音シート。

**【請求項5】**

独立気泡発泡体に形成された貫通孔の長さを $l$  (m)、その断面面積を $s$  ( $m^2$ )、該貫通孔の形成された凹部の体積を $v$  ( $m^3$ )、音速を $C$  (m / 秒)、円周率を $\pi$ とした場合に、

$(C/2\pi) \times (s/vl)^{1/2}$  の値が、50～1000であることを特徴とする請求項1～4のいずれか1項に記載の床用防音シート。

**[CLAIM 5]**

A sound insulation sheet for floors described in any 1 clause of Claims 1-4, in which when the length of a through-hole formed in the closed cell foam is set  $l$  (m), its cross section,  $s$  ( $m^2$ ), the volume of the concave part in which this through-hole was formed,  $v$  ( $m^3$ ), the acoustic velocity,  $C$  (m / second), the circular constant, ( $\pi$ ), the value of  $(C/2 (\pi)) * (s/vl)^{1/2}$  is 50-1000.

**【発明の詳細な説明】**

**[DETAILED DESCRIPTION OF INVENTION]**

**【0001】**

**[0001]**

**【発明の属する技術分野】**

本発明は床用防音シートに関する。

**[TECHNICAL FIELD]**

This invention relates to the sound insulation sheet for floors.

**【0002】**

**[0002]**

**【従来の技術】**

床用防音シートは、床下地材として集合住宅などのコンクリート構造物の居室、廊下、階段の本質床等を使用される他、キッチン、トイレ、子供部屋、老人ホーム、幼稚園のビニル床等に広く使用されており、上階の人の足音等が下階に聞こえないようにするための防音性、柔らかすぎず硬すぎず、疲労が激しいとかいったことがないような歩行感等の機能が要求されている。

**[PRIOR ART]**

The sound insulation sheet for floors is used to the wooden floor of the sitting-room of concrete structures, such as block of flats, a passage, and the step etc. as under-floor ground material, and also it is widely used for the vinyl floor of a kitchen, the toilet, the child room, the retirement home, a kindergarten, etc.

Functions, such as the soundproofing for an lower story being made not to hear the footstep of the people of an upper story etc. and the feeling of a walk wherein it is not the case that it is hard to walk because it is too soft or it is too hard and the fatigue is intense, are required.

## 【0003】

上記防音性を示す指標としては、L値が挙げられる。L値とは、JIS A 1418に準拠して測定した衝撃音レベルから、JIS A 1419に準拠して求めた値である。具体的には、厚さ150mm、重量360kg/m<sup>2</sup>のコンクリートスラブに床材を敷き詰め、その上からタッピングマシンとよばれる軽量衝撃源から衝撃音を発生させて、衝撃音レベルをコンクリートスラブの反対側で周波数別に測定し、その衝撃音レベルを図1に示した遮音等級グラフに当てはめて読み取った値である。L値の読み取り方としては、例えば、L値45では、63Hz～4kHzのどの周波数においても、測定した衝撃音レベルが遮音等級グラフのL45の線よりも下にはならない。

## 【0004】

歩行感については、最適化の目安としては、床材に直径50mmの範囲に80kgfの荷重をかけた際の圧縮歪みが2～3mmとされているが、床材の使用部位等によってそれぞれ異なる。歩行感は、防音性を向上させるために緩衝層を柔らかくしすぎたり、逆に圧縮歪みを小さくするために硬くしすぎたりすると低下する。

## 【0005】

従来から、防音性や歩行感を向上させる方法として、木質床に

## [0003]

L value is mentioned as index which shows above soundproofing. L value is value calculated from the impact noise level measured according to JIS A 1418 according to JIS A 1419. Specifically, it is the value read by laying over flooring to a concrete slab of 150 mm in thickness and 360kg/m<sup>2</sup> weight, generating an impact noise on it from the source of a lightweight shock called tapping machine, measuring an impact noise level by the frequency on the reverse side of the concrete slab, and by applying the impact noise level to the sound insulation rating graph shown in Figure 1.

As for the reading method of L value, for example, with the L value 45, the impact noise level measured must be below the line of L-45 of a sound insulation rating graph, in any of the frequency of 63Hz -4kHz.

## [0004]

About the feeling of a walk, the compression distortion at the time of applying the load of 80kgf on a flooring at the range of 50 mm diameter is considered 2-3 mm as a standard of an optimization. However, it each differs from parts of a flooring to be used, etc.

The feeling of a walk will be reduced if a buffer layer is made too soft, for improve soundproofing, or conversely made too hard for making compression distortion small.

## [0005]

Conventionally, as the method of improving soundproofing and the feeling of a walk, such

溝を形成したり木質床の下に緩衝層を設けたりする方法が採用されている。近年では、上記緩衝層に凹部を形成すると共に各種材料と複合したりしている。緩衝層に凹部を形成すると、共振定数、弾性率等の物性値を低下させ、その結果、緩衝性、防音性等が向上される。例えば、特開平7-97849号公報では、溝が形成された木質床と、少なくとも一方の面に凹部を有するウレタンからなる緩衝層とを貼り合わせた床材が例示されている。しかし、この方法では、木質床の溝形状にもよるが、特定周波数の衝撃音のみが減衰されるのでし値は小さくならず、全体として防音性が向上されないという問題があった。

【0006】

【発明が解決しようとする課題】

本発明の目的は、防音性及び歩行感到優れた床用防音シートを提供することにある。

【0007】

【課題を解決するための手段】  
本発明の床用防音シートは、一方の面に凹部を有し、凹部から他方の面へ貫通孔が形成されている独立気泡率35%以上の独立気泡発泡体からなることを特徴とする。

以下、床用防音シートを床下地材として施工した際に、床表面

method is adopted as making a groove in a wooden floor or providing a buffer layer to the bottom of a wooden floor. In recent years, while forming a concave part in an above buffer layer, it has compounded with various kinds of material. When forming a concave part in a buffer layer, physical property value, such as a load rate and an elasticity, is made to reduce.

As a result, buffer property, soundproofing, etc. improve.

For example, in Unexamined Japanese Patent 7-97849 gazette, the flooring which bonded the wooden floor in which the groove was formed, and the buffer layer which consists of urethane which has a concave part in at least one surface is illustrated.

However, by this method, depending on channel-like of a wooden floor, there is a problem that since only the impact noise of a specific frequency is made attenuated, L value does not become small, and soundproofing does not improve collectively.

[0006]

## [PROBLEM ADDRESSED]

Objective of the invention is to provide the sound insulation sheet for floors excellent in soundproofing and the feeling of a walk.

[0007]

## [SOLUTION OF THE INVENTION]

The sound insulation sheet for floors of this invention has concave part in one surface.

It comprises the closed cell foam of 35 % or more of the rate of closed cell and which the through-hole is formed in the opposite surface from the concave part. It is characterized by the above-mentioned.

Hereafter, the surface which comes to the floor surface side is described as the upper face, and the opposite surface is described as



側にある面を上面、反対面を下面と記す。

**【0008】**

本発明で使用される独立気泡発泡体は、ポリエチレン、ポリスチレン、ポリアクリル等の、従来独立気泡発泡体に使用されている樹脂からなるものであり、発泡倍率は特に限定されないが、一般的には2～50倍が好ましく、10～30倍がさらに好ましい。独立気泡発泡体の独立気泡率は、小さくなると施工時に接着剤の上にのせてからの位置調整が困難になり、また、防音性及び歩行感が低下する傾向があるので35%以上である。尚、本発明でいう独立気泡率は、ASTM 2365に準拠して測定した値である。

**【0009】**

上記独立気泡発泡体は下面に凹部を有し、該凹部から上面へ貫通孔が形成されている。

**【0010】**

上記凹部は250Hz付近の周波数の衝撃音を減衰させるものであり、凹部の形状は、下面全体に対する凹部の占有面積が大きくなると防音性が向上し、また、凹部の設計が容易となるという点で、格子部分以外が凹になるような格子模様とするのが好ましい。

**【0011】**

上記貫通孔は、その設計により任意の周波数の衝撃音を減衰で

the undersurface, when the sound insulation sheet for floors is constructed as under-floor ground material.

**[0008]**

The closed cell foam used with this invention consists of the resin currently used to the closed cell foam conventionally, such as polyethylene, polystyrene, and polyacryl. An expansion ratio is not limited specifically. However, generally 2-50 times are preferable and 10 - 30 times are further preferable.

When the rate of closed cell of closed cell foam is small, a positioning control after carrying on an adhesive at the time of construction will become difficult.

Moreover, since there is tendency that soundproofing and the feeling of a walk reduce, it is 35 % or more.

In addition, the rate of a closed cell said with this invention is the value measured according to ASTM-2365.

**[0009]**

Above closed cell foam has concave part on the undersurface. The through-hole is formed in the upper face from this concave part.

**[0010]**

An above concave part attenuates the impact noise of the frequency near 250Hz. As when the occupied area of the concave part with respect to the whole undersurface becomes large, soundproofing will improve and designing of a concave part will become easy, as for the form of a concave part, it is preferable to make it as the lattice pattern wherein the parts other than the lattice part is concave.

**[0011]**

The above through-hole can attenuate the impact noise of arbitrary frequencies by its design. It is preferable, seeing from the point

きるものであり、強度の点から見て下面の凹部の中央から上面に形成されているのが好ましい。その際、貫通孔の長さを  $l$  (m)、その断面積を  $s$  (m<sup>2</sup>)、貫通孔の形成された凹部の体積を  $v$  (m<sup>3</sup>)、音速を  $C$  (m/秒)、円周率を  $\pi$ 、周波数を  $f_0$  (Hz) とした場合に、 $l$ 、 $s$ 、 $v$  が、

$$f_0 = (C / 2 \pi) \times (\pi s / v)^{1/2}$$

を満たすように貫通孔及び凹部を設計すると、 $f_0$  (Hz) での衝撃音が減衰され、防音性が向上される（ヘルムホルツの共鳴器の原理）。但し、 $f_0$  は、小さくなると人には聞こえにくくなり、大きくなると、音の波長が独立気泡発泡体の厚さに対して十分に短くなり、音は互いに緩衝して減衰されるので、 $50 < f_0 < 1000$  である。貫通孔の設計は、全て同一でもそれぞれ異なっているのもよい。

#### 【0012】

また、独立気泡発泡体の上面には凸部が形成されているのが好ましい。上面に凸部を有すると、貫通孔に伝わる空気伝搬音の量が増加するので、貫通孔による防音性が向上する。上面に凸部を有する場合、上記貫通孔は下面の凹部から上面の凸部以外の部分に形成されているのが好ましい。

#### 【0013】

上記凹部及び凸部を形成する方法としては、エンボスロールにより所望の形状を形成する方法

of strength, to form it in a upper face from the center of a concave part of the undersurface. In that case, if the length of a through-hole is set as  $l$  (m), the cross section,  $s$  (m<sup>2</sup>), the volume of the concave part in which the through-hole was formed,  $v$  (m<sup>3</sup>), the acoustic velocity,  $C$  (m / second), the circular constant, ( $\pi$ ), the frequency,  $f_0$  (Hz), when the through-hole and concave part are designed in such a way that  $l$ ,  $s$ , and  $v$  satisfy  $f_0 = (C/2 (\pi)) * (s/v)^{1/2}$ , the impact noise in  $f_0$  (Hz) attenuates, and Soundproofing improves (principle of the resonator of a Helmholtz).

However, since, when  $f_0$  is small, it will become hard for people to hear, and becoming large, the wavelength of a sound will become short sufficiently to the thickness of closed cell foam, and sound is buffered mutually and attenuated, it is  $50 < f_0 < 1000$ .

The design of through-hole may all be the same, or may each differ.

#### 【0012】

Moreover, it is preferable that convex part is formed in the upper face of a closed cell foam.

Since the quantity of the airborne sound which travels to a through-hole will increase when it has convex part on the upper face, the soundproofing by the through-hole improves.

When it has convex part on the upper face, as for an above through-hole, it is preferable to form it in parts other than convex part on the upper surface from a concave part undersurface.

#### 【0013】

As the method of forming an above concave part and convex part, conventionally well-known arbitrary methods, such as the method of

等の従来公知の任意の方法が採用でき、上記貫通孔を形成する方法としては、ロールにより多数の熱針を突き刺す方法等の従来公知の任意の方法が採用できる

#### 【0014】

上記独立気泡発泡体の上面には、独立気泡率35%以下の連続気泡発泡体が貼り合わされていることが好ましい。連続気泡発泡体を構成する樹脂は、従来連続気泡発泡体に使用されているものが使用でき、例えば、ポリエチレン、ポリウレタン、ポリスチレン、ポリアクリル等が挙げられる。連続気泡発泡体は、床表面からの衝撃音を空気伝搬として、空気の摩擦により衝撃音を減衰させるものであり、また、独立気泡発泡体に伝搬する衝撃音を空気伝搬とするものである。連続気泡発泡体は、床の基礎となるコンクリートから出る水分を吸収したり、施工時に接着剤の上にならせてからの位置調整が困難である傾向があるので、上記独立気泡発泡体の上面に貼り合わされる

#### 【0015】

上記独立気泡発泡体と連続気泡発泡体を貼り合わせる方法としては、接着剤による方法等の従来公知の任意の方法が採用できる

#### 【0016】

本発明の床用防音シートは、施工の際には、独立気泡発泡体の上面が接着剤等により床の基礎

forming desired form by the embossing roll, are applicable.

As the method of forming an above through-hole, conventionally well-known arbitrary methods, such as the method of piercing many heated needles by the roll, are applicable.

#### [0014]

It is preferable that in the upper face of an above closed cell foam bonds the open cell foam of 35% or less of the rate of a closed cell.

As for the resin which comprises an open cell foam, that which is conventionally used to the open cell foam can be used.

For example, polyethylene, a polyurethane, a polystyrene, a polyacryl, etc. are mentioned.

The open cell foam makes the impact noise from the floor surface as air propagation, and attenuates an impact noise by friction of air.

Moreover, the impact noise spread to a closed cell foam is made as air propagation.

Since there is tendency that the open cell foam absorbs the water content which comes out of concrete used as the foundation of a floor, and the positioning control after carrying on an adhesive at the time of construction is difficult, to the upper face of an above closed cell foam, it is bonded.

#### [0015]

As a method of bonding an above closed cell foam and an open cell foam, conventionally well-known arbitrary methods, such as the method by the adhesive, are applicable.

#### [0016]

As for the sound insulation sheet for floors of this invention, the undersurface of a closed cell foam is fixed to concrete which makes the foundation of a floor with an adhesive etc.,

となるコンクリート等に固定されるが、接着剤が多量であると凹部に接着剤が入り込み、その結果、凹部の体積 $v$ が確保できない場合があるので、プラスチックシート、防音性を損なわない $0 \sim 500 \mu\text{m}$ 程度の不織布等を独立気泡発泡体の下面に、接着剤、熱融着等により貼り合わせ、凹部を確保してもよい。

#### 【0017】

本発明の床用防音シートの厚さは、特に限定されるものではないが、一般には5 mm程度にすると歩行感が向上する。

#### 【0018】

以下、図面を参照して、本発明の床用防音シートの1例を説明する。

#### 【0019】

図2は床用防音シート1を下面から見た斜視図であり、図3は上面から見た斜視図であり、図4は図3に示した直線I-Iでの断面模式図である。すなわち、床用防音シート1は、独立気泡発泡体11からなり、下面には、等間隔に、四方形の凹部12が格子模様状に形成されている。上面には、等間隔に円柱状の凸部13が均一に形成されている。凹部12の中央から、上面の凸部13以外の部分へは、貫通孔14が形成されている。貫通孔は、全ての凹部に形成されていても、貫通孔が形成されていない凹部が存在してもどちらでもよい。

during construction. However, when the adhesive is too abundant, an adhesive will enter into a concave part, and as a result, the volume  $v$  of a concave part may be unable to be ensured. Therefore, a plastic sheet, the non-woven fabric of about 50-500-micrometer which does not impair soundproofing may be bonded by the adhesive, thermo-bonding, etc. on the undersurface of a closed cell foam, so as to ensure the concave part.

#### 【0017】

Thickness of the sound insulation sheet for floors of this invention is not limited specifically.

However, generally, when making it to about 5 mm, the feeling of a walk will improve.

#### 【0018】

Hereafter, with reference to a drawing, 1 example of the sound insulation sheet for floors of this invention is explained.

#### 【0019】

Figure 2 is a perspective diagram which looked at the sound insulation sheet for floors 1 from the undersurface.

Figure 3 is a perspective diagram seen from the upper face.

Figure 4 is the cross-sectional model in linear I-I shown in Figure 3. That is, the sound insulation sheet for floors 1 consists of a closed cell foam 11, and the concave part 12 of quadrangle is formed in the undersurface in the shape of a lattice pattern at equal intervals.

Cylinder shaped convex part 13 is uniformly formed in the upper face at regular intervals.

The through-hole 14 is formed in parts other than the convex part 13 of the upper face from the center of a concave part 12.

Whichever is sufficient as for the through-hole whether there is concave part in which the through-hole is not formed or all concave parts have it.

【0020】

[0020]

## 【発明の実施の形態】

以下に実施例を掲げて本発明の態様を更に詳しく説明するが、本発明はこれら実施例のみに限定されるものではない。

## [Embodiment]

An Example is below and the aspect of this invention is explained to it more in detail. However, this invention is not limited only to these Example.

【0021】

[0021]

## 【実施例】

(実施例1) 図2～4で示したように、ポリエチレンからなる、独立気泡率75%、発泡倍率2.0倍、厚さ3.5mmの独立気泡発泡体の上面に、40mm間隔で136mm×136mm四方、深さ1mmの間部を、エンボスロールにより格子模様形成し、上面に、直径10mm、高さ1mmの円柱状の凸部を、エンボスロールにより均一に400個/m<sup>2</sup>形成した。次に、間部の中央より上面の凸部以外の部分へ、直径1mm、長さ1.5mmの貫通孔を、多数の熱針をロールにより突き刺して形成し、床用防音シートを得た。(f<sub>0</sub>=500Hz)

## [Example]

(Example 1)) On the undersurface of the closed cell foam with 75% of the rates of a closed cell, an expansion ratio of 20, and thickness of 3.5 mm which consists of polyethylene, as seen in Figure 2-4, a concave part with a 136 mm \* 136 mm quadrangle, and a depth of 1 mm is formed in a lattice pattern by the embossing roll at intervals of 40 mm, and in the upper face, convex part of cylinder shaped with the diameter of 10 mm and the height of 1 mm was uniformly formed for 400 /m<sup>2</sup> by the embossing roll.

Next, from the center of a concave part, many heated needles were pierced to parts other than convex part on top by the roll, the through-hole with a diameter of 1 mm and a length of 1.5 mm was formed in them, and the sound insulation sheet for floors was obtained. (f<sub>0</sub>=500Hz)

【0022】

[0022]

(実施例2) ポリエチレンからなる、独立気泡率75%、発泡倍率2.0倍、厚さ2.5mmの独立気泡発泡体の下面に、40mm間隔で136mm×136mm四方、深さ1mmの間部を、エンボスロールにより格子模様形成し、間部の中央より

(Example 2) A concave part with a 136 mm \* 136 mm quadrangle and a depth of 1 mm is formed in the undersurface of the closed cell foam with 75% of the rates of a closed cell, an expansion ratio 20, and a thickness of 2.5 mm which consists of polyethylene, by the embossing roll at intervals of 40 mm at a lattice pattern. And from the center of a concave part, many heated needles were pierced to the upper face by the roll, and the through-hole with

上面へ、直径1 mm、長さ1.5 mmの貫通孔を、多数の熱針をロールにより突き刺して形成した。次に、独立気泡発泡体の上面に、接着剤（綜研化学社製、商品名「580 G」）を50 g/m<sup>2</sup>になるようにロール転写により塗布し、ウレタンからなる、独立気泡率10%、発泡倍率60倍、厚さ1.8 mmの連続気泡発泡体を貼り合わせて床用防音シートを得た。

## 【0023】

（実施例3）独立気泡発泡体の上面に、接着剤（綜研化学社製、商品名「580 G」）を50 g/m<sup>2</sup>になるようにロール転写により塗布し、ウレタンからなる、独立気泡率10%、発泡倍率60倍、厚さ1.8 mmの連続気泡発泡体を貼り合わせた以外は実施例1と同様にして床用防音シートを得た。

## 【0024】

（実施例4）独立気泡発泡体の下面に、接着剤（綜研化学社製、商品名「580 G」）を50 g/m<sup>2</sup>になるようにロール転写により塗布し、厚さ400  $\mu$ m、目付量30 g/m<sup>2</sup>の不織布を貼り付けた以外は実施例2と同様にして床用防音シートを得た。

## 【0025】

（実施例5）独立気泡発泡体の下面に、接着剤（綜研化学社製、商品名「580 G」）を50 g/m<sup>2</sup>になるようにロール転写により塗布し、厚さ400  $\mu$ m

a diameter of 1 mm and a length of 1.5 mm was formed in it. Next, an adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G") is applied to the upper face of a closed cell foam by roll transfer so that it may become 50 g/m<sup>2</sup>. The open cell foam with 10% of the rates of a closed cell, an expansion ratio 60, and a thickness of 1.8 mm which consists of urethane was bonded, and the sound insulation sheet for floors was obtained.

## 【0023】

(Example 3) Except that an adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G") was applied to the upper face of a closed cell foam by roll transfer so that it might become 50 g/m<sup>2</sup>, and that the open cell foam with 10% of the rates of a closed cell, an expansion ratio 60, and a thickness of 1.8 mm which consists of urethane was bonded, in the same manner as Example 1, the sound insulation sheet for floors was obtained.

## 【0024】

(Example 4) Except that an adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G") was applied to the undersurface of a closed cell foam by roll transfer so that it might become 50 g/m<sup>2</sup>, and that the non-woven fabric of 400 micrometers in thickness and 30 g/m<sup>2</sup> estimated amount was bonded, in the same manner as Example 2, the sound insulation sheet for floors was obtained.

## 【0025】

(Example 5) Except an adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G") was applied to the undersurface of a closed cell foam by roll transfer so that it might become 50 g/m<sup>2</sup>, and that the non-woven fabric of 400 micrometers in thickness and a 30

m、目付量 $30\text{ g/m}^2$ の繊維布を貼り付けた以外は実施例3と同様にして床用防音シートを得た。

#### 【0026】

(比較例1) ポリエチレンからなる、独立気泡率75%、発泡倍率20倍の独立気泡発泡体から、厚さ1.5 mmの床用防音シートを得た。

#### 【0027】

(比較例2) ポリエチレンからなる、独立気泡率75%、発泡倍率20倍、厚さ2.5 mmの独立気泡発泡体の上面に、直径10 mm、高さ1 mmの円柱状の凸部を、エンボスロールにより均一に400個/ $\text{m}^2$ 形成して床用防音シートを得た。

#### 【0028】

(比較例3) 独立気泡発泡体の上面に、接着剤(綜研化学社製、商品名「580 G」)を $50\text{ g/m}^2$ になるようにロール転写により塗布し、ウレタンからなる、独立気泡率10%、発泡倍率60倍、厚さ1.8 mmの連続気泡発泡体を貼り合わせた以外は比較例2と同様にして床用防音シートを得た。

#### 【0029】

(比較例4) 上面から、厚さ0.25 mmの単板、厚さ4 mmの合板及び厚さ6 mmの熱圧縮発泡ウレタンからなる連続気泡発泡体をこの順に積層し、床材を得た。但し、前記ウレタン合板の上面には、幅3 mm、深さ2.

$\text{g/m}^2$  estimated amount was bonded, in the same manner as Example 3, the sound insulation sheet for floors was obtained.

#### [0026]

(Comparative Example 1) The sound insulation sheet for floors with a thickness of 1.5 mm was obtained from the closed cell foam of 75% of the rates of a closed cell, and an expansion ratio 20, which consists of polyethylene.

#### [0027]

(Comparative Example 2) To the upper face of the closed cell foam with 75% of the rates of a closed cell, an expansion ratio 20, and a thickness of 2.5 mm which consists of polyethylene, Convex part of cylinder shaped with the diameter of 10 mm and the height of 1 mm is uniformly formed 400 pieces/ $\text{m}^2$  by the embossing roll. And the sound insulation sheet for floors was obtained.

#### [0028]

(Comparative Example 3) Except that and adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G") was applied to the upper face of a closed cell foam by roll transfer so that it might become  $50\text{ g/m}^2$ , and that the open cell foam with 10% of the rates of a closed cell, an expansion ratio 60, and a thickness of 1.8 mm which consists of urethane was bonded, the sound insulation sheet for floors was obtained like Comparative Example 2.

#### [0029]

(Comparative Example 4) From a upper face, the open cell foam which consists of a single\_plate of with a thickness of 0.25 mm, a plywood of with a thickness of 4 mm, and heat compression foam urethane with a thickness of 6 mm were laminated in this order, and the flooring was obtained.

However, the groove with a width of 3 mm

5 mmの溝が50 mm間隔で、切削加工により形成されており、前記熱圧縮発泡ウレタンには、上下両面にエンボス加工により凹部が形成されている

### 【0030】

実施例1～5及び比較例1～3で得られた床用防音シート並びに比較例4で得られた床材について、以下の方法で防音性、歩行感及び施工性を評価した。

### 【0031】

(防音性) 実施例1～5及び比較例1～3で得られた床用防音シートについて、以下のようにより評価した。厚さ150 mm、重量360 kg/m<sup>2</sup>のコンクリートスラブ、床用防音シート及び深さ6 mm、幅1 mmの溝が1 cm間隔で形成されている、厚さ10 mmの合板を、接着剤(綜研化学社製、商品名「580 G」)により、この順に貼り合わせた。床用防音シートは、上面がコンクリートスラブの側になるようにした。次に合板の上にタッピングマシンを設置して衝撃音を発生させ、階下の残響室(吸音材が無く、互いに平行な壁が存在しない部屋)にて衝撃音レベルを周波数別に測定し、図1に示した遮音等級グラフよりL値を読み取り、衝撃音レベルとL値を表1に示した。

### 【0032】

比較例4で得られた床材については、合板を貼り合わせなかった以外は上記と同様にして衝撃

and a depth of 2.5 mm is formed in the undersurface of the above-mentioned lauan plywood, cutting at intervals of 50 mm. The concave part is formed in both sides of above-mentioned heat compression foam urethane by the embossing.

### [0030]

About the sound insulation sheet for floors obtained by Examples 1-5 and Comparative Example 1-3, and the flooring obtained by Comparative Example 4, the following method evaluated soundproofing, the feeling of a walk, and the workability.

### [0031]

(Soundproofing) About the sound insulation sheet for floors obtained by Examples 1-5 and Comparative Example 1-3, it evaluated as follows.

A concrete slab of 150 mm in thickness and 360kg/m<sup>2</sup> weight, the sound insulation sheet for floors, and the plywood with a thickness of 10 mm with which the groove with a depth of 6 mm and a width of 1 mm is formed at intervals of 1 cm, were bonded to this order with the adhesive (Soken chemical & Engineering Co., Ltd., brand name "580 G").

As for the sound insulation sheet for floors, the undersurface was made to become a concrete slab side. Next on a plywood, a tapping machine was installed and an impact noise was generated. An impact noise level was measured by the frequency in the downstairs reverberation chamber (room where there is no sound absorbing material and a mutually parallel wall does not exist). L value was read from the sound insulation rating graph shown in Figure 1.

An impact noise level and L value were shown in Table 1.

### [0032]

About the flooring obtained by Comparative Example 4, an impact noise level was measured like an above except not having bonded the plywood.



音レベルを測定し、衝撃音レベルとL値を表1に示した。

An impact noise level and L value were shown in Table 1.

### 【0033】

(歩行感) 実施例1～5及び比較例1～3で得られた床用防音シートの上に合板を貼り合わせ、合板の側から直径50mmの範囲に80kgfの荷重をかけ、その際の圧縮歪みを測定し、以下のように評価し、結果を表1に示した。比較例4で得られた床材については、合板を貼り合わさずに、上記と同様にして圧縮歪みを測定した。

○：しずみ量が3mm未満

◇：しずみ量が3mm以上4mm未満

×：しずみ量が4mm以上

### [0033]

(Feeling of a walk) A plywood was bonded on the upper face of the sound insulation sheet for floors obtained by Examples 1-5 and Comparative Example 1-3, and the load of 80kgf was applied at the range of 50 mm diameter from a plywood side. The compression distortion in that case was measured and it evaluates as follows.

The result was shown in Table 1.

About the flooring obtained by Comparative Example 4, the compression distortion was measured like the above, without bonding a plywood.

O; Depression amount is less than 3 mm.  
 ◇; Depression amount is less than 4 mm and equal to or more than 3 mm.

\*; Depression amount is equal to or more than 4 mm.

### 【0034】

(施工性) 上記防音性の評価の際に、床用防音シート又は床材とコンクリートスラブとを貼り合わせてからの、防音シート又は床材の位置調整が可能であるかどうかにより以下のように評価した。

○：接着面が適度な滑りを持っており、位置調整が可能であった。

×：位置調整は不可能であった。

### [0034]

(Workability) At the evaluation of above soundproofing, after bonding the sound insulation sheet for floors or flooring, and a concrete slab, whether the positioning control of the sound insulation sheet or the flooring would be possible was evaluated as follows.

O; The adhesive surface has moderate sliding. The positioning control was possible.

\*; The positioning control was impossible.

### 【0035】

### [0035]

### 【表1】

### [Table 1]

		実 施 例					比 較 例			
		1	2	3	4	5	1	2	3	4
防音性(L値)		50	45	45	45	45	60	55	50	50
歩行感		◎	◎	○	◎	○	◎	◎	○	◎
施工性		○	○	○	○	○	○	○	○	×
衝撃音レベル (dB)	63Hz	57.6	57.6	57.3	57.3	55.9	65.2	62.6	59.2	60.9
	125Hz	62.1	57.9	58.1	58.1	57.5	69.5	63.6	58.6	61.9
	250Hz	47.6	46.6	45.9	45.9	44.5	63.2	47.1	47.7	47.6
	500Hz	44.2	44.2	44.1	44.1	42.3	47.8	47.8	45.9	47.3
	1kHz	40.3	39.9	38.5	38.5	37.2	42.1	41.3	40.7	41.1
	2kHz	36.5	34.3	34.1	34.1	32.1	36.7	35.8	35.9	36.2
		4kHz	30.6	30.6	30.1	30.1	29.9	31.2	31.6	30.2

Top row left; right:

Examples; Comparative Examples

Left column, top to bottom:

Soundproofing (L value); Feeling of Walk; Workability; Impact Noise Level (dB)

【 0 0 3 6 】

[0036]

#### 【発明の効果】

本発明の床用防音シートは、下面に凹部を有しているので250Hz付近の衝撃音が減衰でき、上面に連続気泡発泡体を貼り合わせるにより125Hz付近の衝撃音が減衰でき、さらには、貫通孔を減衰させたい衝撃音の周波数に合わせて設計することにより、任意の衝撃音が

#### [EFFECT OF THE INVENTION]

Since the sound insulation sheet for floors of this invention has the concave part on the undersurface, it can attenuate the impact noise near 250Hz.

The impact noise near 125Hz can be attenuated by bonding an open cell foam on the upper face.

Furthermore, arbitrary impact noises can be attenuated by designing through-hole with respect to the frequency of the impact noise which needs to be attenuated. By so doing,

減衰できるものであり、防音性に優れたものとなっている。また、本発明の床用防音シートは独立気泡発泡体であるので、歩行感に優れた床材が得られる。

this is excellent in soundproofing.

Moreover, since the sound insulation sheet for floors of this invention is a closed cell foam, the flooring excellent in the feeling of a walk is obtained.

#### 【図面の簡単な説明】

#### [BRIEF EXPLANATION OF DRAWINGS]

##### 【図 1】

遮音等級グラフを示した図である。

##### [FIGURE 1]

It is the figure having shown the sound insulation rating graph.

##### 【図 2】

床用防音シートを、下面側から見た斜視図である。

##### [FIGURE 2]

It is the perspective diagram which looked at the sound insulation sheet for floors from the undersurface side.

##### 【図 3】

床用防音シートを、上面から見た斜視図である。

##### [FIGURE 3]

It is the perspective diagram which looked at the sound insulation sheet for floors from the upper face.

##### 【図 4】

床用防音シートの、図 3 の直線 I-I' での断面模式図である。

##### [FIGURE 4]

It is the cross-sectional model in linear I-I' of Figure 3 of the sound insulation sheet for floors.

#### 【符号の説明】

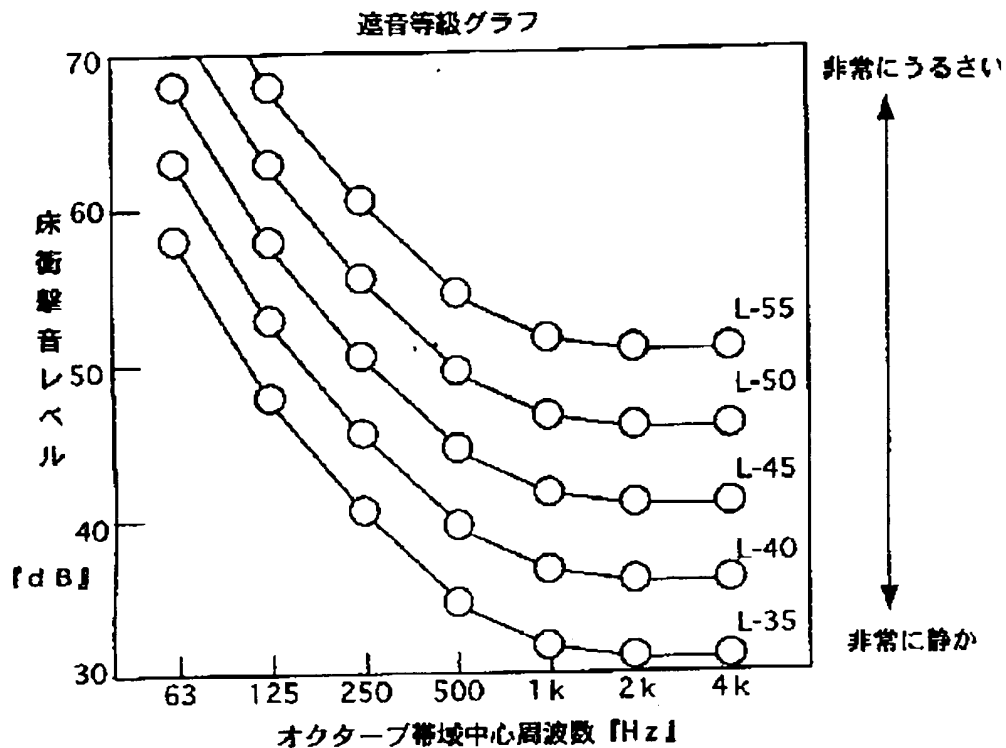
#### [EXPLANATION OF DRAWING]

- 1 床用防音シート
- 1 1 独立気泡発泡体
- 1 2 凹部
- 1 3 凸部
- 1 4 貫通孔

- 1 Sound insulation sheet for floors
- 11 Closed cell foam
- 12 Concave part
- 13 Convex part
- 14 Through-hole

##### 【図 1】

##### [FIGURE 1]



Top:

Sound Insulation Rating Graph

Left:

Floor Impact Noise Level

Right, top and bottom respectively:

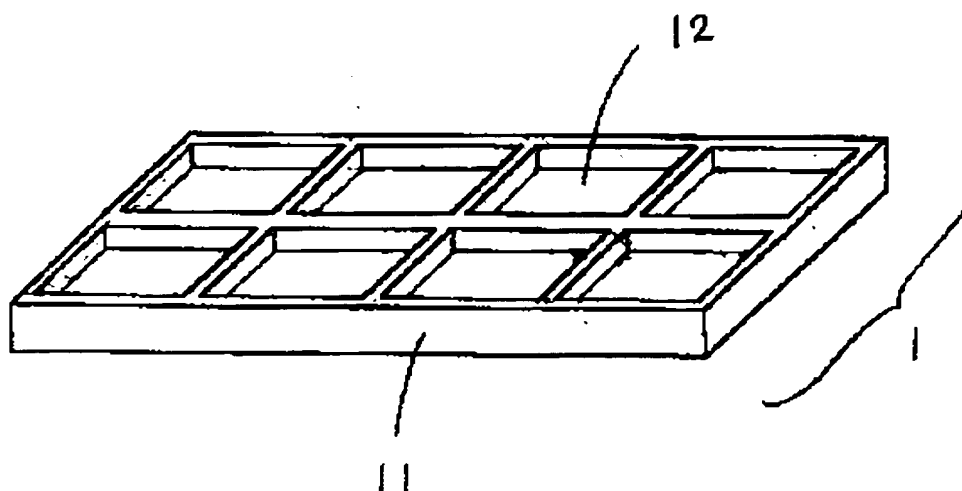
Very Loud; Very Quiet

Bottom:

Octave Band Center Frequency

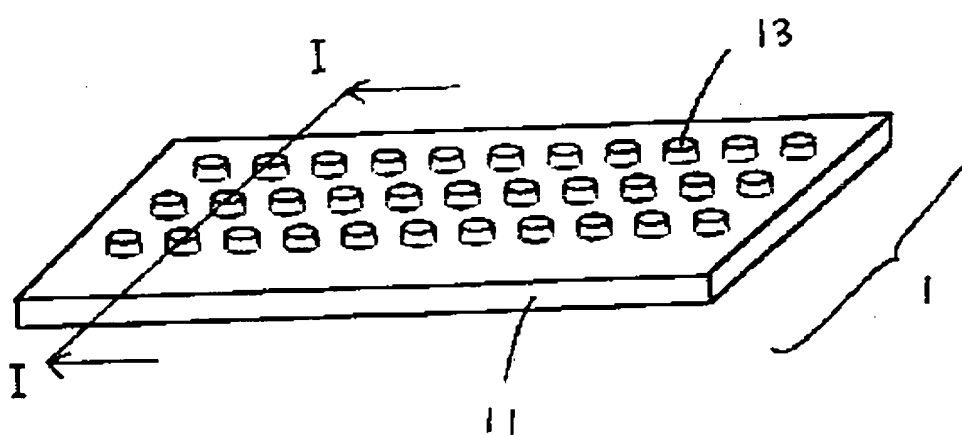
【図 2】

[FIGURE 2]



【図3】

[FIGURE 3]



【図4】

[FIGURE 4]

